

22-2 SOUNDWALL LOAD DISTRIBUTION

This “Memo to Designers” addresses distribution of soundwall gravity loads to the primary load-bearing longitudinal structural members, and applies when using either the Service Load, Load Factor, or Load and Resistance Factor design method. Concrete masonry soundwalls can be very heavy, and it is important to properly consider the force effects on the adjacent structural elements.

Studies of beam-slab bridges and concrete box girders with various span length and girder-spacing combinations have shown that gravity load effects from elements located outside of the exterior girder consistently distribute a disproportionate amount of the load to the exterior girder. The effect of diaphragms aiding the load transfer was not studied.

The following guidelines shall be used for the determination of soundwall dead load effects on girder and stringer elements where the girders are “closely-spaced” per *Caltrans Bridge Design Specifications (BDS)* or the cross-section is “typical” per *AASHTO LRFD Specifications*: the number of girders n , is at least four, girder spacing is equal, and overhangs are no wider than one-half of the minimum effective girder spacing. Other structural configurations including steel box girders are considered “non-standard”, and load distribution is accomplished using a more refined method of analysis.

Three-dimensional modeling may be used to obtain the shear and flexural load distribution to the bridge stringers, girders, or beams in lieu of using the values provided in this memo. Alternatively, torsion procedures in Article 5.8.3.6 of the *AASHTO LRFD Specifications* may be used.

Concrete Box Girder Bridges

Shear

- The soundwall shear force effects in the exterior girder adjacent to the soundwall shall be determined by applying **100%** of the soundwall dead load to the exterior girder. That is, $1.0 * V_{\text{soundwall}}$
- The soundwall shear force effects in the first interior girder adjacent to the soundwall shall be determined by assuming that the dead load from the soundwall is distributed equally to all girders. That is, $V_{\text{soundwall}}/n$

Flexure

- The soundwall flexural force effects in the exterior girder adjacent to the soundwall shall be determined by applying **60%** of the soundwall dead load to the exterior girder. That is, $0.6 * M_{\text{soundwall}}$
- The soundwall flexural force effects in the first interior girder adjacent to the soundwall shall be determined by assuming that the load from the soundwall is distributed equally to all girders. That is, $M_{\text{soundwall}}/n$
- The soundwall flexural force effects in all other girders may be ignored

Beam-Slab Bridges

(Shear and Flexure)

- The soundwall force effects in the exterior girder adjacent to the soundwall shall be determined by applying **75%** of the soundwall dead load to the exterior girder. That is, $0.75 * M_{\text{soundwall}}$ or $0.75 * V_{\text{soundwall}}$
Effects due to torsion are not included
- The soundwall force effects in the first interior girder adjacent to the soundwall, shall be determined by applying **25%** of the soundwall dead load to the girder. That is, $0.25 * M_{\text{soundwall}}$ or $0.25 * V_{\text{soundwall}}$
- The soundwall force effects in all other girders may be ignored

Notes

1. Barrier loads may be equally distributed to all girders only when a soundwall is not involved.
2. Shear correction factors for skew shall be used where applicable, and in addition to load distribution factors stated herein. See Bridge Design Aids 5-32.

General Notes

Load distribution of soundwall loads shall be addressed in the General Notes to facilitate any future modifications to the structure or excess permit load requests. If the provisions of this memo are used, the following is acceptable:

The soundwall dead load is distributed on the left/right side of the bridge with ___% of the moment and ___% of the shear forces to the exterior girder, and ___% of the moment and ___% of the shear to the first interior girder.

If load distribution is accomplished using three-dimensional analysis, a table must be created. For example, a box girder bridge with four webs and a soundwall on the side of girder A would be as follows:

| LOAD DISTRIBUTION (Soundwall Dead Load) | | | | |
|---|------|-----|------|------|
| Girders | A | B | C | D |
| Moment | 60% | 25% | 0.00 | 0.00 |
| Shear | 100% | 25% | 0.00 | 0.00 |

Questions on soundwall load distribution should be directed to the Technical Committee for Loads. Questions on soundwall design should be directed to the Technical Specialist for Soundwalls. Questions on superstructure design for soundwall loads should be directed to the Technical Committees or Specialists for Reinforced Concrete, Prestressed Concrete, or Structural Steel.

Original signed by Richard D. Land

Richard D. Land
Deputy Chief, Division of Engineering Services,
Structure Design